

EXECUTIVE SUMMARY

Efficiency Vermont (“EVT”) is the first Energy Efficiency Utility in the United States; it is the only utility whose sole purpose is to help users of electricity save energy through efficiency and conservation. This report provides results from an initial process evaluation of the commercial and industrial (“C&I”) portion of EVT’s activities and a market assessment of Vermont’s C&I sector.¹

This Executive Summary briefly summarizes EVT’s history; describes the research goals and methods used in this evaluation; provides an assessment of EVT’s activities in the C&I sector; describes Vermont’s C&I firms, market actors, and markets; and presents resulting conclusions and recommendations.

EFFICIENCY VERMONT

Efficiency Vermont began operating in March 2000 offering programs including service to C&I firms (end users) initially built on prior utility sponsored programs. EVT’s programs focus on opportunities for energy efficiency in new construction, major renovations, remodeling, and equipment replacements. EVT offers financial incentives and technical assistance to C&I end user firms and the building and equipment professionals they work with. EVT also created a specialized service to educate organizations about and help them meet the energy-efficiency objectives of Act 250, Vermont’s land-use planning and development law, using the Department of Public Service’s (“DPS”) commercial building energy-efficiency guidelines.

During the years 2000 through 2002, EVT built the demand for and participation in its C&I programs through a comprehensive marketing and outreach effort. Targeted audiences included architects, building decision-makers, the media, utilities, trade allies, and each utility’s largest C&I firms. EVT produced informational materials, and expanded and marketed the popular annual Better Buildings by Design Conference to the C&I sector.

EVT’s accomplishments in the C&I sector from its inception in March 2000 through December 2002 include the following:²

- EVT actions saved 48,494 MWh (exceeding its goal of 42,267 MWh);

¹ This study is both a process evaluation and a market assessment. An impact evaluation and verification of savings was conducted separately by the Vermont Department of Public Service.

² Figures are preliminary, obtained from Efficiency Vermont.

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- EVT served 1,181 C&I firms (through 11/30/02);³
- EVT offered 25 workshops and seminars; and
- EVT worked with 783 market actors, including architects, consultants, general contractors, electrical contractors, mechanical, and heating, ventilation and air conditioning (“HVAC”) contractors, facilities engineers, project engineers and developers.

Additional information detailing EVT’s accomplishments can be found in their own annual reports and in other documents prepared by the DPS and EVT.

RESEARCH GOALS AND METHODS

Efficiency Vermont’s start-up phase and first three years of operation clearly are impressive. To better understand what EVT has accomplished (through their current programs and delivery methods), and how to make future programs and services even more effective, the primary goals of the initial evaluation were to:

- Develop an understanding and detailed characterization of the C&I markets for energy efficiency products and services in Vermont;
- Establish baselines for long term tracking of program effects on the market;
- Assess how the EVT C&I programs mesh with the market characterization findings and how the programs can be improved to maximize their effectiveness; and
- Provide timely feedback to help managers meet the goals of the energy efficiency utility and improve programs to achieve optimal results.

Primary and secondary research activities included:

- Telephone surveys with hundreds of market participants and other key stakeholders including architects, engineers, contractors, equipment suppliers, real-estate managers/developers, EVT program managers, electric distribution utility staff, and DPS staff;
- Telephone surveys with nearly 600 C&I end user firms in three categories:

³ Number excludes multifamily dwellings, which involve C&I market actors, but install primarily residential measures.

1. Firms that constructed new buildings under permits issued by the Department of Labor and Industry (“DLI”) in 1998 or 1999;⁴
 2. Firms adding to, renovating, or remodeling existing structures under permits issued by the DLI in the same time period; and
 3. Firms that did not need and had not received a construction permit (*i.e.*, those not constructing new buildings nor adding to, renovating, or remodeling existing buildings);
- Site visits to C&I facilities that have recently completed new construction, renovation and/or equipment replacement projects to provide a more detailed characterization of the C&I market; and
 - Review of dozens of reports, studies and documents relating to Vermont’s and other regional C&I energy efficiency activities and markets.

C&I firms constitute the end users in the building construction and equipment market. Other participants in this market include those who supply the construction goods and services, collectively termed “market actors.” Interviews were conducted with random samples of four types of market actors:

1. Designers—architects and engineers;
2. Contractors—general, mechanical, and electrical;
3. Suppliers—of mechanical, electrical, window, and motor equipment; and
4. Real estate professionals—property developers and managers.

Site visits were conducted at 76 C&I facilities drawn from the telephone survey pool to round out survey data collection on end users by supplementing self-reported results from the phone surveys with direct field observation. Significant data have been collected during these site visits and are currently being analyzed. Therefore, where appropriate, only preliminary findings from the on-sites surveys are included in this Executive Summary.

⁴ The years 1998–1999 were chosen based on studies elsewhere showing that the time from permitting to completion of a project is typically two to four years. The objective was to ensure that respondents from completed facilities were interviewed so that they could address what, in fact, was installed, rather than what was planned and might not come to pass. Projects that progressed from permitting to completion quickly did not have an opportunity to receive services from EVT, which began operating in March 2000.

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Table ES.1 identifies each C&I market actor and end user group and provides estimates of the population sizes, sample sizes, and survey methods used. In total, nearly 600 C&I end users and over 150 designers, contractors, suppliers and real estate professionals were interviewed.

Table ES.1
SAMPLING PLAN 2001-2002 BASELINE DATA COLLECTION ACTIVITIES

C&I MARKET ACTOR GROUPS	ESTIMATED POPULATION ⁵	SAMPLE PLANNED	COMPLETED INTERVIEWS	APPROACH
DESIGNERS				
Architects	126	30	30	Phone
Mechanical & Electrical Engineers	67	15	16	Phone
CONTRACTORS				
General Contractors	205	30	31	Phone
Electrical Contractors	152	25	23	Phone
HVAC/ Mechanical Contractors	149	25	19	Phone
				Continued

⁵ Population estimates were based on US Census data, supplemented by data purchased from Info USA, DLI permit files, EVT lists and other sources where available.

C&I MARKET ACTOR GROUPS	ESTIMATED POPULATION ⁵	SAMPLE PLANNED	COMPLETED INTERVIEWS	APPROACH
EQUIPMENT SUPPLIERS				
Lighting/ Electrical Suppliers	39	10	7	Phone
HVAC/ Mechanical Suppliers	48	5	4	Phone
Windows Suppliers	154	5	7	Phone
Motor Suppliers	41	5	5	Phone
REAL ESTATE PROFESSIONALS				
Property Developers & Managers	163	15	16	Phone
C&I FIRMS (END USERS)				
C&I Construction Permit Holders	839	200	200	
• Permits for New Buildings	471	100	92	Phone
	—	36	36	On site
• Permits for Renovations	368	100	108	Phone
	—	29	29	On site
General C&I Firms	20,000	230	396	
• Purchased Equipment In Past 2 Years (Replacement Equipment)	8,000	—	158	Phone
	—	15	11	On site
• No Equipment Purchased in Past 2 Years (No replacement)	12,000	—	238	Phone

HOW EFFICIENCY VERMONT IS DOING

Efficiency Vermont has made a positive contribution to the number and kinds of energy-efficiency measures installed within C&I projects in Vermont. It has succeeded in establishing good visibility and awareness in the state. All of the engineers interviewed recognized EVT, as well as over 80% of the architects, about 75% of the contractors and real estate professionals, and about half of the C&I firms (end users).

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In fact, 90% of the engineers spontaneously identified EVT as the name of an organization that promotes energy efficiency throughout Vermont. Fewer than half of the general contractors, however, made this spontaneous identification. This difference in recognition between the two types of professionals is significant because general contractors are used on about 80% of C&I construction projects, whereas engineers are used on only about 40% of projects. As a result of this finding, EVT has already begun to consider ways to expand their outreach to the general contractor group.

Approximately 80% of the engineers, half of the designers, and one-third of the contractors and developers reported using one or more EVT services (see Table ES.2). Seventeen percent of C&I firms (end users) interviewed with permitted construction projects reported using EVT services, as did about one-fourth of the C&I firms replacing equipment. These findings indicate both that EVT has been making a positive impact and that there remains a large pool of market actors and C&I firms in Vermont that have not made use of EVT services.

Table ES.2

PROPORTION OF INTERVIEWED MARKET ACTORS AND END USERS USING EVT SERVICES

MARKET ACTOR	USED ANY EVT SERVICE	USED ONLY FINANCIAL INCENTIVES	USED ONLY ASSISTANCE/ INFORMATION SERVICES	USED BOTH FINANCIAL AND ASSISTANCE SERVICES
DESIGNERS				
Architects	47%	3%	17%	27%
Engineers	81%	19%	12%	50%
CONTRACTORS				
General Contractors	29%	15%	6%	6%
Mechanical Contractors	31%	5%	0%	26%
Electrical Contractors	30%	9%	4%	17%
DEVELOPERS				
Developers	38%	6%	6%	26%
C&I FIRMS (END USERS)				
C&I Construction Projects	17%	3%	4%	10%
C&I Equipment Replacement Projects	27%	6%	8%	13%

For each respondent group that reporting using EVT services, respondents were more likely to use both financial incentives and technical assistance or other information services than they were to use either financial or technical assistance alone. General contractors were an exception to this; they were most likely to use only financial incentives. Comparing financial and technical assistance, financial incentives were used with equal or greater frequency than technical assistance by engineers and contractors. Architects and end users more frequently reported using technical assistance than financial incentives.

Across all the market participant groups, about 60% of respondents who had reported using EVT rated EVT services highly in each of four areas explored, as shown in Table ES.3. The table provides the proportion of respondents rating EVT services a “4” or a “5” on a 5-point scale with “5” being the highest rating.

Table ES.3

PROPORTION OF RESPONDENTS HIGHLY RATING THE EVT SERVICES THEY RECEIVED

MARKET PARTICIPANT	USEFULNESS OF INFORMATION	RESPONSIVENESS TO PROJECT NEEDS	QUALITY OF SERVICES	KNOWLEDGE
Architects	64%	57%	71%	50%
Engineers	62%	38%	46%	46%
General Contractors	63%	50%	50%	63%
Mechanical Contractors	50%	83%	50%	33%
Electrical Contractors	86%	71%	86%	86%
Developers	60%	60%	40%	40%
C&I Construction Projects	80%	70%	83%	89%
C&I Equipment Replacement Projects	74%	60%	72%	43%

Designers and contractors identified *insufficient information about efficiency options* and *limitations in their ability to analyze efficiency options* as major barriers to energy efficiency, as noted below. For those that rated EVT’s services highly, EVT is succeeding in reducing barriers to energy efficiency in Vermont. As shown in Table ES.3, there still remains much room for improvement.

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C&I firms that have received services from EVT are more likely than other firms to report having installed efficiency measures in their permitted construction projects or their purchased equipment systems (e.g., newly replaced heating or lighting systems).

Review of EVT's programs and documents and interviews with EVT staff and staff in several of the state's electric utilities reveal EVT is addressing participants in the C&I market in a professional and well-thought out manner.

Finally, the data, conclusions and recommendations from this evaluation (along with draft findings that have been shared directly with EVT and the DPS as they became available upon completion of specific evaluation activities) have been useful to EVT to improve its C&I programs for 2003. Recent EVT actions include:

- Actively recruiting trade allies through direct outreach to architects, engineers, and suppliers of motors and HVAC equipment;
- Increasing trade allies' participation in the Northeast Energy Efficiency Partnerships' effective Cool Choice HVAC program and Motor UP motors program;
- Fully implementing a new market-focused approach; and
- Expanding the program to help C&I firms follow the DPS energy-efficiency guidelines for meeting Act 250 objectives.

ASSESSING THE ENERGY-EFFICIENCY MARKET IN VERMONT

EVT already is having a positive impact on energy efficiency in Vermont. It can do even better by meeting the specific needs of each type of market actor and market segment, as is planned for 2003. In other words, EVT can use evaluation data to pinpoint which services each group already is using, which ones they still want and need, how to stimulate their interest in energy efficiency, and how to provide those services. The market assessment looked at:

- Firm size, location, and other characteristics;
- The people involved in the projects and decisions, including C&I firms, market actors, and real estate professionals;
- Barriers to energy-efficient designs, products, and practices;
- The rate at which organizations and market actors are implementing energy efficiency measures and practices; and
- Involvement with and opinions about the Act 250 energy criteria.

Brief findings within each of these market assessment areas are summarized below:

Vermont's C&I Firms

Understanding the size and location of Vermont's C&I firms and the nature of their construction and renovation activity is crucial for knowing how to best encourage them to choose the energy-efficient alternative.

Size

Overall, firms in Vermont's C&I sector show the same variation in size as other New England firms. More than half of the state's C&I firms occupy buildings under 5,000 square feet in size, and fewer than 15% occupy buildings of 25,000 square feet or more. In total, there are about 20,000 C&I firms in the state;⁶ about 3,000 of these are large, occupying 25,000 square feet or more. To put Vermont's C&I stock in perspective, a nearby out-of-state utility serving an area about half the size of Vermont has approximately 4,000 large C&I accounts.

Location

For the purposes of this evaluation, the state is divided in three regions: Chittenden County; cities and towns outside of Chittenden County with population greater than 7,500 (termed "small urban areas"); and rural areas of the state. Table ES.4 shows the distribution of C&I firms in these areas. The rural areas of the state have more construction projects for their population than the rest of the state, but the projects are smaller than elsewhere, so the total square footage affected is more in proportion to the population. Conversely, Chittenden County has few projects for the size of its population, but these projects are larger and so the total square footage affected is also in rough proportion to its population.

⁶ Data from 1997 Economic Census, U.S. Census Bureau (19,717 establishments with payrolls). A published business list for 2002 reported 32,262 firms, including sole proprietorships without payroll. Statewide, there are 42,303 commercial and 413 industrial electricity accounts.

Table ES.4

DISTRIBUTION OF RESIDENTIAL AND COMMERCIAL ACTIVITY IN VERMONT

PERCENT OF VERMONT'S:	CHITTENDEN COUNTY	SMALL URBAN AREAS	RURAL AREAS
Residential Population	25%	33%	42%
C&I Firms	30%	35%	35%
C&I Permitted Construction Projects	15%	25%	60%
C&I Constructed Floorspace (square footage)	24%	29%	47%

C&I Construction and Equipment Projects

Construction Activity and Professionals Used

About 16% of Vermont's C&I end-user firms (839) applied to DLI for a construction permit during the two year of period 1998 to 1999. Just over half of these firms applied for permits to construct a new building; the rest applied for permits for construction within an existing facility (primarily additions, with renovations a distant second). Approximately 120 of the permits were for large projects over 25,000 square feet.

A synopsis of the professionals used in these construction projects is presented below:

- Architects designed half the permitted projects (about 410 projects, including 70 large ones, for a total of nearly 60% of the constructed floorspace);
- Contractors worked directly with the project owners, usually without the services of an architect (in a construction approach termed "design-build") on the remaining projects (about 430 projects, including 50 large ones, for a total of about 40% of the constructed floorspace)
- Fifty percent of contractors report at least half their work is design-build, and all but 25% report they do some design-build work.
- Ten percent of architects and 50% of engineers report doing a little design-build work.

The design of the building is a significant determinant of how energy efficient the occupied facility will be. Given that half of the projects do not involve an architect, Efficiency Vermont needs to work with contractors and building owners in order to affect the building's design.

Briefly, the construction professionals have the following characteristics:

- Most construction companies are small. The proportion of firms having four or fewer employees are:
 - Architects—80%,
 - Engineers—46%,
 - Contractors—25 to 35% (depending on type);
- Most construction firms work in both the residential and C&I sector, although 29% of general contractors work exclusively in the C&I sector;
- The construction firms are located throughout the state in rough proportion to the level of construction activity in the area; and
- Half of the real estate firms manage less than 75,000 square feet, a relatively small amount.

Major Equipment Purchases and Equipment Suppliers

About 40% of Vermont's approximately 20,000 C&I firms purchased major building equipment systems (lighting, heating, and/or windows) in the two years prior to our surveys (mid-2000 to mid-2002). Purchases were equally divided among heating, lighting, and window equipment, with approximately half of the firms purchasing more than one type of equipment. Firms purchased and installed the equipment through contractors and equipment suppliers.

Most C&I equipment suppliers were found to be small companies with annual revenues of \$5 million or less. The supply firms are scattered throughout the state, with many small firms located in the rural areas. A few firms located in neighboring states sell equipment in Vermont. With just a few exceptions, the supply firms interviewed sold equipment to residential as well as C&I customers. This finding was true for motor suppliers as well as for suppliers of other types of equipment.

Decision-Making for Construction and Equipment Projects

In order to influence the energy-efficiency of construction and renovation projects, it is important to understand who influences the decisions about building construction and equipment selection.

C&I firms with permitted construction projects used a lighting contractor, general contractor, and mechanical contractor on about 85%, 80%, and 70% of their projects respectively. About half of the

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projects used architects, and about 40% used mechanical and/or electrical engineers (about one-third of firms reported using each type of engineer). Approximately one-third of the firms that were interviewed reported using five or six professionals on their projects; about one-third used three or four; and one-third used one or two professionals.

The C&I end-user firms and construction professionals interviewed reported decisions about HVAC equipment were influenced most often by general and mechanical contractors. Decisions about lighting equipment were influenced most often by lighting contractors. When engineers were involved in a construction project, they frequently had a strong influence on equipment decisions. For both HVAC and lighting systems, owners and suppliers also influenced the decisions.

Nearly 90% of the architects and engineers reported their clients were concerned about energy efficiency, yet only about half had marketing materials that showed the firm's capabilities in energy-efficient design. Mechanical contractors were the most likely contractor group to have marketing materials that address energy-efficiency capabilities (40%), followed by electrical contractors (25%), and general contractors (15%).

Energy Efficiency in C&I Construction and Equipment Projects

Barriers to Energy Efficiency

Factors that may hinder or prevent the use of energy efficiency measures are often referred to as "market barriers". EVT is successful in promoting energy efficiency to the extent it reduces market barriers.

The research found some substantial barriers to selecting, specifying and procuring energy efficient equipment and building practices in C&I construction projects.

- About two-thirds of designers (architects and engineers) said a major barrier is clients' unwillingness to fund their analysis of the applicability of energy-efficiency options. Designers are less likely to specify these options if they can't fund the analysis of whether the options will meet the demands of the specific situation, their effects on other features and systems, and the expected costs and benefits.
- Designers (architects and engineers) and contractors reported getting accurate information about energy-efficiency options and getting reliable estimates of energy-efficiency costs and benefits was often difficult. (Between 25 and 60% of each group rated each of these factors as substantial barriers.)
- About one-third of contractors identified the higher cost of energy-efficient products as a considerable barrier.

Apparent barriers from the small samples of suppliers interviewed include:

- Lack of awareness and knowledge of efficient equipment - which appeared to be a barrier among some C&I equipment suppliers. Mechanical suppliers rated themselves as moderately knowledgeable about efficient equipment. Motor suppliers rated themselves as having little knowledge of efficient motor drives. Two noteworthy exceptions to this knowledge barrier were: lighting/electrical and window suppliers who rated themselves as highly knowledgeable about efficient equipment.
- The marketing approach of windows and motor suppliers appears to be a barrier. Both supplier groups reported their clients are most interested in non-energy savings-related product performance criteria, yet both groups reported promoting energy-efficient equipment on the basis of energy savings alone.

Attitudes about the quality of light output of high-efficiency lighting were found to be a barrier for some C&I end user firms that undertook construction. The attitudes of end users with respect to high-efficiency HVAC equipment did not reveal any additional barriers.

Finally, interviews with end users revealed *limited discussion about energy efficiency options between contractors and C&I firms* is also a significant barrier to the more widespread use of energy efficient construction practices and the installation of energy efficient equipment.

EVT reduces many of these barriers by providing information to designers, contractors, developers, and owners on available energy-efficiency options, their costs and benefits. Assistance in the analysis of options offered by EVT is also valuable, including technical assistance to analyze the applicability of efficient options to a specific construction project and monetary incentives offered to owners to offset the cost of analysis activities their design teams engage in. EVT rebates for high-efficiency equipment address the barrier cited by contractors of higher equipment costs.

Current Energy-Efficiency Practices

Perhaps as a result of a long history of energy efficiency programs in Vermont, including EVT's efforts, C&I firms, designers, contractors, and developers in the state were found to demonstrate high levels of awareness of many energy efficiency measures. Converting this awareness into actual installation and use of energy efficient equipment is more difficult to achieve. Table ES.5 presents the proportions of C&I firms reporting the installation of efficiency measures in their construction and equipment projects,

and their rates of awareness of the measures.⁷ Although EVT has been effective in encouraging the installation of efficiency measures, much work remains to be done.

Table ES.5 shows only three measures that have been installed by more than about half of the respondents. No distinction is made in this table between firms that were or were not involved with Act 250 or that did or did not use EVT services. However, the study found that C&I firms using EVT services installed more efficiency measures than other firms.

Table ES.5
INSTALLATION AND AWARENESS OF EFFICIENCY MEASURES AMONG C&I FIRMS
(END USERS) WITH CONSTRUCTION AND EQUIPMENT PROJECTS

EFFICIENCY MEASURES	INSTALLED MEASURE IN PROJECT		AWARE OF MEASURE	
	CONSTRUCTION PROJECT	EQUIPMENT PROJECT	CONSTRUCTION PROJECT	EQUIPMENT PROJECT
Electronic Ballasts	70%	58%	84%	84%
Installed Any Electronic Controls	68%	NA	NA	NA
Low-E Glass*	62%	44%	83%	85%
Programmable Thermostat*	52%	31%	90%	92%
LED Exit Signs	49%	29%	78%	66%
Compact Fluorescent Lamps	45%	40%	82%	72%
T-8 Lights*	38%	31%	47%	35%
Lighting Controls	26%	11%	58%	45%
Economizer	25%	8%	48%	44%
Condensing Furnace*	23%	12%	52%	40%

⁷ Many of the efficiency measures included in this table have been commercially available for many years. EVT encourages the use of these measures, as well as the use of newer, more “cutting edge” measures and practices. Assessing the use of newer measures and practices, however, is difficult to do in telephone survey research because of the respondents’ general unfamiliarity with these newer measures and their difficulty in accurately answering questions about them. Detailed analysis of this evaluation’s recently completed site visits may provide additional insight into the use of these newer energy efficiency measures.

Occupancy Sensors	19%	14%	58%	53%
Energy Management System	18%	13%	59%	58%
Variable Frequency Drive	18%	35%	NA	NA

* Preliminary results from the onsite surveys suggest C&I firms moderately over-reported (by approximately 10 percentage points) the installation of programmable thermostats, low-e glass, and condensing furnaces. The C&I firms moderately under-reported the installation of T-8 lamps.

Variations by Size of Firm

Larger C&I firms are more likely than smaller firms to install each measure, although size of firm is not a factor in awareness of measures among firms undertaking construction. The following factors contribute to the finding that larger projects and firms install more efficiency measures than smaller ones:

- Larger firms have more capital, more access to capital, more staff, and more specialized staff, all of which provide resources for installing energy efficient measures;
- Larger projects bring together more professionals and have greater varieties of space, increasing the odds of involving a professional committed to, and finding evident opportunities for, efficiency; and lastly,
- EVT has targeted larger firms, conducting meetings in 2001 with firms identified by the state's utilities as their largest customers.

Baselines for Long Term Tracking of Market Effects

Consistent with its primary goals, the study identified over 50 market indicators for the long-term tracking of market effects, and estimated baseline values for these indicators. Table ES.6 provides, as an example, one indicator for each market actor group. The interested reader will find all of the indicators in the Conclusions and Recommendations section (chapter nine) of this report. A forthcoming analysis of data collected from the on-site surveys of C&I firms may yield additional market indicators.

Table ES.6
SELECTED MARKET INDICATORS

MARKET ACTOR	INDICATOR	BASLINE MEASURE: PERCENT MEETING CRITERION
All Designers, Contractors, Suppliers	Aware of 2001 Vermont Guidelines for Energy Efficient Commercial Construction	< 5%
Architects	Specify less lighting or automatic dimming due to day lighting features on at least 50% of projects	27%
Engineers	Design or size HVAC system taking passive systems into consideration on at least 50% of projects	6%
General Contractors	Use independent, third-party commissioning of building systems on at least 50% of projects	6%
Electrical Contractors	Lighting system exceeds ASHRAE 90.1 1999 standards on at least 50% of projects	4%
Continued		
Mechanical Contractors	Heating system exceeds ASHRAE 90.1 1999 standards on at least 50% of projects	32%
Electrical Equipment Suppliers	Photo-cells with dimming ballasts	43% of suppliers sell; equipment about 2% of sales
Window Suppliers	Aware of SHGF rating on products sold	Less than 10%
Motor and VFD Suppliers	Knowledge of VFDs	80% below "4" on 10-point scale rating knowledge
End Users with Construction Projects	Install occupancy sensors	19%
End Users with Equipment Projects	Install programmable thermostats	31%
Real Estate Developer Projects	Install energy management systems	20%

Act 250

Those involved in the C&I construction market were asked about their experience with and opinions on Act 250. About half of the developers and C&I firms with construction projects permitted in 1998 and 1999 and about one-fifth of C&I firms without such construction projects reported having had an Act 250 energy review at some point. Three-fourths of the engineers and two-thirds of architects reported having been involved in at least one Act 250 review, as did about half of the general contractors, one-fourth of mechanical contractors, and about 15% of electrical contractors.

Engineers and property developers held the most favorable opinion of the energy impact of Act 250; about two-thirds of both groups thought projects reviewed under Act 250 had either more or a higher level of energy-efficiency features than they would have had without the Act 250 review. About half of the architects, general contractors, and C&I firms with permitted construction projects shared this view. Smaller proportions of electrical and mechanical contractors expressed this opinion. Larger general contractors were more likely than smaller ones to have been involved in Act 250 and to rate its effect highly. No other differences by respondent size were found.

Interpretation of C&I Construction and Equipment Market

Vermont's building and construction designers, contractors, and suppliers seize the opportunities that present themselves: large or small projects, commercial or industrial or residential clients, nearby or farther away, new construction, renovation or remodeling. In Vermont's comparatively small C&I market, research through this study is showing word-of-mouth communication and social networks are particularly important.

It is frequently assumed in markets outside Vermont that the largest building and equipment firms specialize in serving the largest C&I end users and are the most knowledgeable about energy-efficiency opportunities. As a consequence, it is assumed these firms comprise an important niche and targeted services are designed for them. Yet, this research revealed that, in Vermont, size does not predict which designers and contractors are the most informed and proactive in regards to energy efficiency, nor does it predict which C&I firms they are working with.

Larger C&I firms tend to *install* the most efficiency measures for a variety of reasons, but smaller and larger construction professionals are equally likely to *encourage* their clients to choose energy-efficiency options. Also, it is apparent the characteristics of the professionals used on a project contribute as much or more than size to the number of efficiency measures used. Projects during which the end user discussed energy use with a mechanical engineer (or, to a somewhat lesser degree, with architects or general contractors) had more energy efficiency measures installed than other projects. In addition, projects with a greater number of design and contractor professionals had more measures installed than projects with a fewer number of professionals, independent of the size of the project.

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To date, engineers and contractors that have used EVT services have used rebates more frequently than technical assistance. This fits with the finding that contractors report higher costs of efficient equipment as a barrier to efficiency. Architects have more frequently used the technical assistance offered by EVT than its rebates. Architects and engineers both identified as significant barriers a lack of information about efficiency options, costs, and benefits, and architects identified limitations on their ability to analyze options within the financial constraints of their contracts.

Although C&I firms, designers, contractors and developers reported for some efficiency measures fairly high proportions of installations, for all measures there was room for increased installation; for many measures, there is considerable room for increased installation rates.

MAKING EFFICIENCY VERMONT EVEN BETTER

The research conducted during Phase I of this C&I evaluation effort, shows EVT is working well for Vermonters. It also reveals EVT can do even more to improve the markets and increase the use of energy efficient equipment and services in the state's C&I sectors.

Following are some key Phase I conclusions and recommendations that may help to make EVT and its C&I energy-efficiency programs even more effective. They have been divided into two categories: (1) program-related improvements; and (2) additional research. It is the researcher's belief that these program-related opportunities will increase building and construction professionals' knowledge of and communication with C&I firms about energy-efficiency options. In addition, these conclusions and recommendations will help the DPS identify how it can enhance this first evaluative effort to increase its positive impacts on energy efficiency in Vermont. Chapter nine of this evaluation report provides more detail about these conclusions and recommendations.

EVT Programs

1. *Impacts on C&I Firms' Energy-Efficiency Decisions*

CONCLUSION: EVT is successfully reaching those involved in the design and construction of new and existing building projects throughout the state, and is influencing their decisions to invest in energy efficiency. C&I firms (end users) and market actors are using both EVT's financial incentives and its technical assistance.

Recommendation: EVT should continue its incentives, promotion, and outreach efforts.

2. *Statewide Services*

CONCLUSION: EVT appears to be serving firms throughout the state, but its technical assistance is reaching fewer of the non-Act 250 projects in rural and small urban areas than it is in other project/location combinations.

Recommendation: EVT should increase technical assistance in these areas through meetings, and/or strategically placing staff to provide these services directly.

3. *Educating C&I Construction Service Providers*

CONCLUSION: C&I firms are more likely to use energy-efficient technologies and practices if they discuss them with their architects, mechanical and electrical engineers, and general, mechanical and electrical contractors.

Architects and mechanical engineers are the most effective at incorporating energy-efficiency options in their clients' projects. However, clients hire them less often than other building professionals. Therefore, other market actors must also have information about energy-efficiency options so they can present them to clients with small and medium permitted and non-permitted construction projects.

Recommendation: EVT should continue to work closely with designers and contractors to increase their awareness of and skills with energy-efficiency solutions so they can effectively present them to clients. EVT should continue adding sessions at the Better Buildings by Design Conference about how to discuss energy efficiency with skeptical clients.

EVT should follow-through with plans to increase educational efforts with contractors, and with real estate developers to expand their awareness and use of energy-efficiency solutions. One option is to offer sessions geared for these actors at the Better Buildings by Design Conference.

4. *Equipment Suppliers and Manufacturers*

CONCLUSION: Based on the limited sample of suppliers interviewed, Phase I research found equipment suppliers to be among the least informed market actors about energy efficiency. This suggests manufacturers are not educating them about energy-efficient products, and contractors and C&I firms are not demanding the products from suppliers.

Recommendation: It appears from this study sample that EVT should continue and expand efforts recently begun to target outreach to suppliers, and continue to collaborate with regional and national organizations that work with manufacturers.

5. *Lighting*

CONCLUSION: Many C&I firms seek “high-quality” lighting; while some portion of firms spontaneously equated energy-efficient lighting with high quality, an equal proportion explicitly described it as being of low quality. Contractors and real estate developers are concerned about the cost of efficient lighting equipment.

Recommendation: EVT should continue to offer rebates to address cost concerns, and continue actively promoting the DesignLights Consortium's Knowhow™ educational lighting guidelines series. EVT should consider creating a lighting design lab or demonstration site to showcase the high quality lighting that high-efficiency lighting systems can provide. In addition, EVT should go forward with plans to more aggressively promote comprehensive lighting efficiency services and incentives under its “Comprehensive Track”.

Research Recommendations

1. *Process Evaluation 2003-04*

CONCLUSION: In the coming years, EVT plans to embark on an effort to focus on market sectors while also expanding its relationships with trade allies.

Recommendation: A process evaluation conducted throughout 2003-04 will be very useful to determine if program processes are successfully reaching and influencing market participants to increase their use of energy efficiency technologies and practices.

2. *Opinion Leader Research*

CONCLUSION: In Vermont’s comparatively small C&I building marketplace word-of-mouth communication and social networks appear to be particularly important. Market actors of all sizes work with residential and commercial/industrial clients of all sizes, on all types of projects.

Recommendation: As part of the process evaluation, interviews should be conducted with market actors who have used EVT services to get more information about their experiences with EVT, and to help determine how EVT can reach other firms in Vermont.

3. *Supplier Research*

CONCLUSION: EVT and DPS may want a better estimate of baseline market conditions for key products offered by suppliers. Phase I data about suppliers are weak because the suppliers were particularly hard to reach and sample sizes were small.

Recommendation: Future supplier research should focus on the measures most frequently promoted by EVT. Experience elsewhere has shown suppliers and manufacturers rarely cooperate with studies seeking detailed information on their inventories in the absence of monetary compensation. For a research strategy focused solely on Vermont suppliers to be cost effective the inquiry should focus on a limited number of equipment options; thus an investigation of the items most relevant to EVT's activities would be recommended. Alternatively, EVT or the DPS should participate in various regional and national efforts being considered to track product market shares by state. This would provide economies of scale that cannot be achieved in a single state study.

4. *Market Indicator Study*

CONCLUSION: The current, comprehensive study provides a market assessment and a baseline evaluation of EVT's initial C&I program efforts (including identification of key market progress tracking indicators). Thus, in 2004 or 2005, a second study will need to determine, in comparison with the baseline results, if EVT has helped the market expand its knowledge, awareness, and use of energy-efficient solutions.

Recommendation: The next market study should focus on market indicators of energy efficiency improvement, and include samples of designers, contractors, suppliers, C&I firms, and real estate professionals, as interviewed for the current study.

5. *Act 250 Impacts Study*

CONCLUSION: Of those who have had experience with Act 250, as many believe it has improved the energy efficiency of projects as believe it has had little effect. Sorting out the effects of Act 250, EVT, and the new guidelines and procedures relating to Act 250 is very difficult. As a consequence, the impacts of the Act 250 process on energy efficiency are currently inconclusive.

Recommendation: Additional effort to sort out the effects of Act 250 on energy efficiency should be conducted in separate studies from this evaluation of EVT. The evaluation, however, should continue to examine the effect of EVT efforts with Act 250 projects and to explore whether these effects are reaching to non Act 250 projects as well.

6. *Other Recommended Evaluation Priorities for 2003-04*

In addition to these research recommendations, a number of other research activities planned for the 2003–04 time period are presented in the main body of this report, including the need for a more detailed analysis of on-site survey results.

Recommendation: Once the on-sites analysis is completed, relevant findings should be integrated with the results presented in this report.